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(71) Applicants:  
• **KT&G Corporation**  
**Daedeok-gu**  
**Daejeon 34337 (KR)**  
• **Kolon Industries, Inc.**  
**Seoul 07793 (KR)**

(72) Inventors:  
• **HWANG, Min Hee**  
**34128 Daejeon (KR)**  
• **MOON, Sung Min**  
**34128 Daejeon (KR)**  
• **KI, Sung Jong**  
**34128 Daejeon (KR)**  
• **YANG, Jin Chul**  
**34128 Daejeon (KR)**

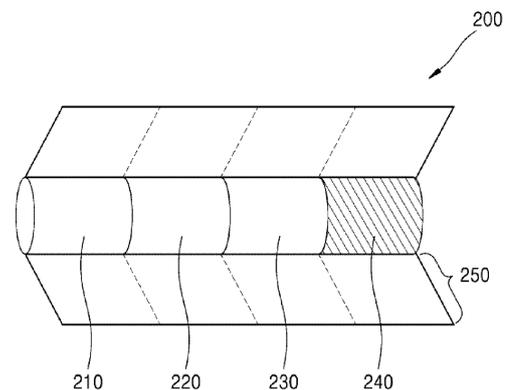
- **HA, Sung Hoon**  
**34128 Daejeon (KR)**
- **LEE, John Tae**  
**34128 Daejeon (KR)**
- **MA, Kyeng Bae**  
**34128 Daejeon (KR)**
- **AHN, Ki Jin**  
**34128 Daejeon (KR)**
- **JEONG, Jong Cheol**  
**07793 Seoul (KR)**
- **JIN, Sang Woo**  
**07793 Seoul (KR)**
- **PARK, Eun Young**  
**07793 Seoul (KR)**
- **LEE, Jeong Hun**  
**07793 Seoul (KR)**
- **SEO, Seung Dong**  
**07793 Seoul (KR)**
- **HWANG, Yeong Nam**  
**07793 Seoul (KR)**

(74) Representative: **Isarpatent**  
**Patent- und Rechtsanwälte**  
**Barth Hassa Peckmann & Partner mbB**  
**Friedrichstraße 31**  
**80801 München (DE)**

(54) **SMOKING ARTICLE INCLUDING LYOCELL TOW**

(57) A smoking article is provided. The smoking article includes a first portion including an aerosol-generating substrate impregnated with an aerosol-generating element, a second portion including a tobacco element, a third portion including a cooling element, and a fourth portion including a filtering element, wherein the first portion, the second portion, the third portion, and the fourth portion are sequentially arranged along the longitudinal direction of the smoking article, and the third portion includes lyocell tow including a plurality of lyocell fibers.

FIG.5



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**Description**

[Technical Field]

5 **[0001]** The present invention relates to a smoking article capable of providing a more improved smoking experience to a user by preventing a cooling element from melting due to high temperature caused by heat applied for heating the smoking article by applying lyocell tow in the cooling element of the smoking article.

[Background Art]

10 **[0002]** In smoking articles, the transfer of tobacco components (e.g., nicotine and tar) and the production of vapor have a significant impact on a user's smoking experience. Generally, the smoking article operates by a method in which a stick is heated to a high temperature of about 150 to 300 °C using a device, the applied heat is transferred to a medium portion to increase the temperature of the medium portion, and thus tobacco components such as nicotine and the like are smoothly transferred. In this process, materials such as glycerin and the like are heated to generate vapor, and the tobacco components contained in the vapor are delivered so that a user can inhale them. However, when the device is set to a temperature equal to or less than the boiling point of glycerin, vapor is not smoothly generated, and thus a problem that the transfer of tobacco components is limited occurs.

15 **[0003]** In order to solve this problem, conventionally, a method in which a cooling portion (some segment of a filtering portion) was provided in the smoking article so that a user's discomfort resulting from the hot smoke inhaled by a user is reduced was employed.

20 **[0004]** When cellulose acetate (hereinafter, abbreviated as "CA") tow is used in a conventionally used cooling portion, the CA tow melts or deforms at a temperature of about 70 °C or higher and then solidifies again, and this phenomenon interferes with smooth transfer of smoke, generates a negative off-flavor, and prevents a cooling function from working properly.

25 **[0005]** Therefore, to improve the performance of smoking articles, materials that are able to withstand a heating temperature of about 200 to 300 °C so that the atomization and transfer of tobacco components can smoothly proceed are required. Such materials should be able to improve a user's smoking experience by effectively lowering the temperature of smoke without melting or being deformed at high temperature. Also, there is a need for materials that are able to deliver sufficient tar and nicotine components upon inhalation by minimizing the dilution of tobacco components in a cooling process.

[Disclosure]

35 [Technical Problem]

**[0006]** One object of the present invention is to provide a smoking article, which includes a first portion including an aerosol-generating substrate impregnated with an aerosol-generating element, a second portion including a tobacco element, a third portion including a cooling element, and a fourth portion including a filtering element, wherein the third portion is composed of lyocell tow including a plurality of lyocell fibers so that the smoking article is capable of preventing or minimizing the deformation resulting the heat transferred from a heater for heating the smoking article or an aerosol generated in the smoking article due to the excellent heat resistance of the lyocell tow.

40 **[0007]** Another object of the present invention is to provide a smoking article, which includes a first portion including an aerosol-generating substrate impregnated with an aerosol-generating element, a second portion including a tobacco element, a third portion including a cooling element, and a fourth portion including a filtering element, wherein the third portion is composed of lyocell tow including a plurality of lyocell fibers so that the smoking article is capable of reducing the heat felt by a user and maximizing a cooling effect by effectively reducing the amount of moisture delivered during smoking due to the excellent moisture affinity of the lyocell tow.

45 **[0008]** Still another object of the present invention is to provide a smoking article, which includes a cooling element composed of a binder and lyocell tow including a plurality of lyocell fibers so that the smoking article is capable of stably maintaining its shape by imparting appropriate hardness to the lyocell tow through the binder even though the cooling element is a tubular structure composed of lyocell tow.

50 **[0009]** The objects of the present invention are not limited to those mentioned above, and other unmentioned objects can be clearly understood by those skilled in the art to which the present invention pertains from the description below.

55 [Technical Solution]

**[0010]** According to one aspect of the present application for achieving the above objects, there is provided a smoking

article, which includes a first portion including an aerosol-generating substrate impregnated with an aerosol-generating element, a second portion including a tobacco element, a third portion including a cooling element, and a fourth portion including a filtering element, wherein the first portion, the second portion, the third portion, and the fourth portion are sequentially arranged along the longitudinal direction of the smoking article, and the third portion includes lyocell tow including a plurality of lyocell fibers.

**[0011]** In some embodiments, the lyocell tow of the third portion may have a tubular shape with a hollow formed therein.

**[0012]** In some embodiments, the third portion may further include at least one binder dispersed in a plurality of the lyocell tow.

**[0013]** In some embodiments, the binder may include at least one of a cellulose-based binder, a vinyl-based binder, a polyester-based binder, a dextrin-based binder, and a starch-based binder.

**[0014]** In some embodiments, an inner diameter of the third portion may be 10 to 90% of an outer diameter of the third portion.

**[0015]** In some embodiments, the outer diameter of the third portion may be 6 mm to 10 mm.

**[0016]** In some embodiments, the inner diameter of the third portion may be 2 mm to 6 mm, and the inner diameter of the third portion is smaller than the outer diameter.

**[0017]** In some embodiments, the outer diameter of the third portion may be 6 mm to 10 mm, and the inner diameter of the third portion may be 2 mm to 6 mm. The inner diameter of the third portion is smaller than the outer diameter.

**[0018]** In some embodiments, the inner diameter of the third portion may be 10 to 90% of the outer diameter of the third portion, the outer diameter of the third portion may be 6 mm to 10 mm, and the inner diameter of the third portion may be 2 mm to 6 mm.

**[0019]** In some embodiments, the fourth portion may include at least one of cellulose acetate and lyocell.

**[0020]** In some embodiments, the aerosol-generating element may include at least one of glycerin, propylene glycol, ethylene glycol, dipropylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, and oleyl alcohol.

**[0021]** According to another aspect of the present application, there is provided a system including the above-described smoking article and an aerosol-generating device using the same.

**[0022]** According to still another aspect of the present application, there is provided a method of manufacturing the above-described smoking article.

[Advantageous Effects]

**[0023]** In a smoking article according to an embodiment which includes a first portion including an aerosol-generating substrate impregnated with an aerosol-generating element, a second portion including a tobacco element, a third portion including a cooling element, and a fourth portion including a filtering element, since the third portion is composed of lyocell tow including a plurality of lyocell fibers, the smoking article can prevent or minimize the deformation resulting from the heat transferred from a heater for heating the smoking article or an aerosol generated in the smoking article due to the excellent heat resistance of the lyocell tow.

**[0024]** In addition, in a smoking article which includes a first portion including an aerosol-generating substrate impregnated with an aerosol-generating element, a second portion including a tobacco element, a third portion including a cooling element, and a fourth portion including a filtering element, since the cooling element is composed of lyocell tow including a plurality of lyocell fibers, the smoking article can reduce the heat felt by a user and maximize a cooling effect by effectively reducing the amount of moisture delivered during smoking due to the excellent moisture affinity of the lyocell tow compared to cellulose acetate tow.

**[0025]** Additionally, since the smoking article according to an embodiment includes a cooling element composed of lyocell tow including a plurality of lyocell fibers and at least one binder, appropriate hardness can be imparted to the lyocell tow through at least one binder. Accordingly, the shape of the cooling element can be stably maintained even though the cooling element (third portion) is a tubular structure composed of lyocell tow, and due to the stable shape maintenance, the quality of a smoking experience can be prevented from being degraded due to deformation of the cooling element (third portion) when the smoking article is stored and/or smoked.

**[0026]** Advantageous effects according to the technical spirit of the present disclosure are not limited to those mentioned above, and other unmentioned advantageous effects can be clearly understood by those of ordinary skill in the art from the description below.

[Description of Drawings]

**[0027]**

FIGS. 1 to 4 are diagrams showing examples in which an aerosol-generating article is inserted into an aerosol-generating device.

FIG. 5 is a diagram showing a smoking article according to an embodiment.

FIG. 6 shows images obtained by photographing a third portion (a cooling element) of Example 1 and a third portion (a cooling element) of Comparative Example 1, wherein FIG. 6A is an image obtained by photographing the third portions (cooling elements) of Comparative Example 1 and Example 1 before an experiment (before smoking), and FIG. 6B is an image obtained by photographing the third portions (cooling elements) of Comparative Example 1 and Example 1 after the experiment (after smoking).

[Modes of the Invention]

**[0028]** Hereinafter, exemplary embodiments of the present disclosure will be described in detail with reference to the accompanying drawings. Advantages and features of the present disclosure and methods of achieving the same should become clear with embodiments described in detail below with reference to the accompanying drawings. However, the technical spirit of the present disclosure is not limited to the following embodiments and may be implemented in various different forms. The following embodiments are only provided to make the technical spirit of the present disclosure complete and completely inform those of ordinary skill in the art to which the present disclosure pertains of the scope of the present disclosure. The technical spirit of the present disclosure is defined only by the scope of the claims.

**[0029]** In assigning reference numerals to components of each drawing, it should be noted that the same reference numerals are assigned to the same components wherever possible even when the components are illustrated in different drawings. Also, in describing the present disclosure, when it is determined that the detailed description of a known related configuration or function may obscure the gist of the present disclosure, the detailed description thereof will be omitted.

**[0030]** Unless otherwise defined, all terms including technical or scientific terms used herein have the same meaning as commonly understood by those of ordinary skill in the art to which the present disclosure pertains. Terms defined in commonly used dictionaries should not be interpreted in an idealized or overly formal sense unless expressly so defined herein. Terms used herein are for describing the embodiments and are not intended to limit the present disclosure. In the present specification, a singular expression includes a plural expression unless the context clearly indicates otherwise.

**[0031]** Also, in describing components of the present disclosure, terms such as first, second, A, B, (a), and (b) may be used. Such terms are only used for distinguishing one component from another component, and the essence, order, sequence, or the like of the corresponding component is not limited by the terms. In a case in which a certain component is described as being "connected," "coupled," or "linked" to another component, it should be understood that, although the component may be directly connected or linked to the other component, still another component may also be "connected," "coupled," or "linked" between the two components.

**[0032]** The terms "comprise" and/or "comprising" used herein do not preclude the presence or addition of one or more components, steps, operations, and/or devices other than those mentioned.

**[0033]** First, some terms used herein will be clarified.

**[0034]** In the present specification, a "smoking article" may refer to any product that can be smoked or any product that can provide a smoking experience, regardless of whether the product is based on tobacco, tobacco derivatives, expanded tobacco, reconstituted tobacco, or tobacco substitutes. For example, the smoking article may include products that can be smoked, such as cigarettes, cigars, and cigarillos.

**[0035]** In the present specification, a "smoking material" may refer to any type of material that can be used in a smoking article.

**[0036]** In the present specification, the term "user" may be used interchangeably with the term "consumer."

**[0037]** In the present specification, "upstream" or "upstream direction" may refer to a direction moving away from an oral region of a smoker, and "downstream" or "downstream direction" may refer to a direction approaching the oral region of the smoker.

**[0038]** In the present specification, a "longitudinal direction" may refer to a direction corresponding to a longitudinal axis of a smoking article. The "longitudinal axis" of a smoking article may refer to an imaginary line extending along the main longitudinal direction of a smoking article. This axis generally runs from one end (e.g., the mouthpiece or filter end) to the opposite end (e.g., the combustion or heat source end) of a smoking article.

**[0039]** In the present specification, a "lyocell filter" refers to a filter including or composed of lyocell tow.

**[0040]** In the present specification, "lyocell tow" includes or is composed of a plurality of lyocell fibers. In some embodiments, the lyocell tow may refer to a bundle formed by cross-connecting adjacent lyocell fibers.

**[0041]** In the present specification, "lyocell fibers" may refer to fibers made of lyocell cellulose. Particularly, lyocell fibers may be fibers made of cellulose derived or primarily derived from wood pulp, especially, semi-synthetic fibers.

**[0042]** In the present specification, a "shaped cross-section" is defined as a cross-section having a shape including a plurality of protrusions instead of having a circular shape. For example, a cross-section having a shape in which a plurality of protrusions branch and/or extend from the center and/or the center of the cross-section may be referred to as a shaped cross-section. Here, the "protrusion" may refer to a distinct, extended segment or arm extending outward from the central core or joining point of the cross-section of a lyocell fiber.

**[0043]** In some embodiments, the lyocell fibers may have a Y-shaped cross-section with three protrusions branching and/or extending from the center and/or the center of the cross-section, a cross-shaped cross-section with four protrusions, and/or a star-shaped cross-section with five protrusions, or an O-shaped cross-section, but the present invention is not limited thereto.

**[0044]** In some embodiments, the lyocell fibers may include three or more protrusions branching and/or extending from the center and/or the center of the cross-section.

**[0045]** In some embodiments, the lyocell fibers included in the lyocell tow may have a Y-shaped cross-section for application in cigarette filters.

**[0046]** In the present specification, a "hollow" may refer to a channel extending along the longitudinal direction.

**[0047]** In the present specification, "being composed of" an element may refer to including or consisting of the element.

**[0048]** In the present specification, a "tubular rod" as a filter rod may refer to a filter rod with a hollow formed therein, and a filter rod without a hollow formed therein may be referred to as a "cylindrical rod."

**[0049]** In the present specification, a "recess-type rod" as a filter rod may refer to a filter rod with one or more pores.

**[0050]** In the present specification, the hardness of a third portion is a value obtained by quantifying the degree to which a diameter of the third portion is maintained when the third portion is pressed with a certain level of force in a direction perpendicular to the longitudinal direction of the third portion, and may be a percentage value of a ratio of a diameter of the third portion after the force is applied to a diameter of the third portion before the force is applied. For example, the hardness (%) of the third portion may be calculated by  $(D-a)/D \times 100\%$ . Here, D represents a diameter of the third portion, and a represents a distance the third portion moves downward due to a 300 g weight (i.e., the third portion is pressed). The measurement values required to calculate the hardness may be obtained, for example, using DHT 200™ commercially available from Filtrona Group. In measuring the hardness, the force applied to the third portion may be considered to be a value equivalent to the force applied to the smoking article by an actual user (e.g., the force at which an actual user holds the smoking article).

**[0051]** A filter of a smoking article according to one aspect of the present invention may collect at least a portion of smoke generated during smoking of the smoking article. In some embodiments, the filter of the smoking article may collect total particulate matter (hereinafter, abbreviated as "TPM") including at least a portion of at least one of nicotine (hereinafter, abbreviated as "Nic"), tar, propylene glycol (hereinafter, abbreviated as "PG"), and glycerin (hereinafter, abbreviated as "Gly") included in smoke generated during smoking of the smoking article.

**[0052]** In the present specification, "draw resistance" refers to the static pressure difference between two ends of a sample when an airflow passes through the sample. In the present specification, "PDC" refers to a draw resistance value measured in a state in which a medium portion is open, the perforations of the filtering portion are blocked, and the inflow of outside air is blocked, and "PDO" refers to a draw resistance value measured in a state in which a medium portion is open, the perforations of the filtering portion are not blocked, and the inflow of outside air is allowed. For example, draw resistance may be measured according to the ISO standard 6565:2015 method. According to the ISO standard 6565:2015 method, draw resistance may refer to the static pressure difference between two ends of a sample when an airflow passes through the sample under normal conditions ( $22 \pm 2$  °C,  $60 \pm 5\%$  relative humidity) with a volume flow rate of 17.5 mm/s at the discharge end.

**[0053]** In the present specification, the "ventilation rate (hereinafter, abbreviated as "Vent")" of a smoking article may be defined as a percentage value of a ratio of the total volume flow rate (e.g., ml/s) of air entering the smoking article without burning or heating through the front region, that is, the longitudinal upstream end, of the smoking article to the total volume flow rate (e.g., ml/s) of air at the outlet, that is, the longitudinal downstream end, of the smoking article. For example, the ventilation rate may be measured according to ISO 9512:2019. For example, the total volume flow rate of air entering the smoking article without burning or heating through the front region may be the total volume flow rate of air entering in a direction perpendicular to the longitudinal direction of the smoking article. For example, the total volume flow rate of air entering the smoking article without burning or heating through the front region may be the total volume flow rate of air entering the smoking article through wrapping paper.

**[0054]** In the present specification, organic acid is a general term for organic compounds that are acidic.

**[0055]** In some embodiments, room temperature may refer to 20 °C to 25 °C.

**[0056]** In the present specification, when no separate physical quantity is indicated, component percent (%) and component proportion refer to the weight percent (wt%) and weight proportion of a component, respectively.

**[0057]** In the present specification, "puff" refers to an action of inhaling or drawing air through a smoking article for generating and inhaling smoke or vapor. "Puff count" may refer to the total number of inhaling or drawing actions during use of a smoking article. Alternatively or additionally, the puff count may be the maximum number of inhaling or drawing actions that a smoking article can provide before it is completely consumed or ceases to function.

**[0058]** In the present specification, Health Canada (HC) conditions may include a puff volume of 55 ml, a puff frequency of 30 seconds, and a puff duration of 2 seconds. Particularly, the HC conditions may be based on a state in which the perforations of a filter are blocked. In measurement under the HC conditions, the puff count may be 9.

**[0059]** The contents of components included in total particulate matter (TPM) in the collected smoke may be analyzed

through gas chromatography-mass spectrometry (GC/MS). For example, the contents of components included in TPM in the collected smoke may be measured using a GC/MS device after a Cambridge filter (a Cambridge filter pad (CFP)) collecting smoke is immersed in isopropyl alcohol (IPA) for a predetermined time (e.g., 20 minutes to 16 hours) in the case of tar or nicotine and in methanol for a predetermined time (e.g., 2 hours to 16 hours) in the case of PG and Gly, then treated

using a shaking device, and passed through a polytetrafluoroethylene (PTFE) syringe filter to remove impurities. The immersion time may be 20 minutes or more in the case of tar or nicotine and 2 hours or more in the case of PG and Gly.

[0060] The GC/MS may be, for example, a measuring device commercially available from Agilent Technologies, Inc.

[0061] Hereinafter, various embodiments of the present disclosure will be described in detail with reference to the accompanying drawings.

[0062] Throughout the present specification, a "tobacco element" refers to an element including a tobacco material.

[0063] Throughout the present specification, a "tobacco material" refers to any form of material including components derived from tobacco leaves.

[0064] Throughout the present specification, a "cooling element" refers to an element that cools any material. For example, the cooling element may cool an aerosol generated from an aerosol-generating element or a tobacco element.

[0065] Throughout the present specification, a "filtering element" refers to an element including a filtering material. For example, the filtering element may include a plurality of fiber strands.

[0066] FIGS. 1 to 4 are diagrams showing examples in which an aerosol-generating article is inserted into an aerosol-generating device.

[0067] First, an aerosol-generating device will be described with reference to FIGS. 1 to 3.

[0068] Referring to FIG. 1, an aerosol-generating device 100 includes a battery 110, a control unit 120, and a heater 130. Referring to FIGS. 2 and 3, the aerosol-generating device 100 may further include a vaporizer 140. Particularly, a smoking article 200 may be inserted into the internal space of the aerosol-generating device 100.

[0069] In the aerosol-generating device 100 shown in FIGS. 1 to 3, components related to the present embodiment are illustrated. Therefore, it will be understood by those skilled in the art related to the present embodiment that other general-purpose components may be further included in the aerosol-generating device 100 in addition to the components shown in FIGS. 1 to 3.

[0070] In addition, although it is illustrated in FIGS. 2 and 3 that the aerosol-generating device 100 includes the heater 130, if necessary, the heater 130 may be omitted. In some embodiments, the aerosol-generating device 100 may not include a heater. In some embodiments, the battery 110, the control unit 120, and the vaporizer 140 are sequentially disposed, that is, disposed in a row along the longitudinal direction of the smoking article 200.

[0071] In FIG. 1, it is illustrated that the battery 110, the control unit 120, and the heater 130 are disposed in a row. In some embodiments, the battery 110, the control unit 120, and the heater 130 are sequentially disposed along the longitudinal direction of the smoking article 200. Also, it is illustrated in FIG. 2 that the battery 110, the control unit 120, the vaporizer 140, and the heater 130 are disposed in a row along the longitudinal direction of the smoking article 200. Also, it is illustrated in FIG. 3 that the vaporizer 140 and the heater 130 are disposed in parallel. However, the internal structure of the aerosol-generating device 100 is not limited to those shown in FIGS. 1 to 3. In other words, the disposition of the battery 110, the control unit 120, the heater 130, and the vaporizer 140 may vary depending on the design of the aerosol-generating device 100.

[0072] When the smoking article 200 is inserted into the aerosol-generating device 100, the aerosol-generating device 100 may operate the heater 130 and/or the vaporizer 140 to generate an aerosol from the smoking article 200 and/or the vaporizer 140. The aerosol generated by the heater 130 and/or the vaporizer 140 is delivered to a user by passing through the smoking article 200.

[0073] If necessary, even when the smoking article 200 is not inserted into the aerosol-generating device 100, the aerosol-generating device 100 may operate the heater 130.

[0074] The battery 110 supplies power used to operate the aerosol-generating device 100. For example, the battery 110 may supply power so that the heater 130 and/or the vaporizer 140 can operate, and may supply power required to operate the control unit 120. Particularly, the battery 110 may supply power required to operate a display, a sensor, a motor, and the like installed in the aerosol-generating device 100.

[0075] The control unit 120 controls the overall operation of the aerosol-generating device 100. In particular, the control unit 120 controls the operation of not only the battery 110, the heater 130, and the vaporizer 140 but also other components included in the aerosol-generating device 100. Particularly, the control unit 120 may also determine whether the operation of the aerosol-generating device 100 is possible by checking the state of each component of the aerosol-generating device 100.

[0076] The control unit 120 includes at least one processor. The processor may be implemented as an array of multiple logic gates and implemented as a combination of a general-purpose microprocessor and a memory storing a program that can be executed on the microprocessor. Also, it will be understood by those skilled in the art to which the present embodiment pertains that the processor may be implemented as other types of hardware.

[0077] The heater 130 may be heated by the power supplied from the battery 110. For example, when the smoking article

200 is inserted into the aerosol-generating device 100, the heater 130 may be located outside the smoking article 200. Therefore, the heated heater 130 may increase the temperature of an aerosol-generating material in the smoking article 200.

5 [0078] The heater 130 may be an electrically resistant heater. For example, the heater 130 includes an electrically conductive track, and as current flows through the electrically conductive track, the heater 130 may be heated. However, the heater 130 is not limited to the above-described example, and any heater may be used without limitation as long as it can be heated to a desired temperature. Here, the desired temperature may be preset in the aerosol-generating device 100 or may be set by a user.

10 [0079] In another example, the heater 130 may be an induction heating-type heater. Particularly, the heater 130 may include an electrically conductive coil for heating an aerosol-generating article by an induction heating method, and the aerosol-generating article may include a susceptor that can be heated by the induction heating-type heater.

[0080] For example, the heater 130 may include a tubular heating element, a plate-shaped heating element, a needle-shaped heating element, and/or a rod-shaped heating element, and the inside and/or outside of the smoking article 200 may be heated according to the shape of a heating element.

15 [0081] Particularly, a plurality of heaters 130 may be disposed in the aerosol-generating device 100. In this case, a plurality of heaters 130 may be disposed so as to be inserted into the inside of the smoking article 200 or may be disposed outside the smoking article 200. Particularly, some of the plurality of heaters 130 may be disposed so as to be inserted into the inside of the smoking article 200, and the remainder may be disposed outside the smoking article 200. In some embodiments, the heater 130 may heat the inside and outside of the smoking article 200. Also, the shape of the heater 130 is not limited to the shapes shown in FIGS. 1 to 3, and the heater may be manufactured in various shapes. In some embodiments, the heater 130 may include an electrically resistant heater and an induction heating-type heater.

20 [0082] The vaporizer 140 may heat a liquid composition to generate an aerosol, and the generated aerosol may be delivered to a user by passing through the smoking article 200. In other words, the aerosol generated by the vaporizer 140 may move along the airflow path of the aerosol-generating device 100, and the airflow path may be configured so that the aerosol generated by the vaporizer 140 can be delivered to a user by passing through the smoking article 200.

25 [0083] For example, the vaporizer 140 may include a liquid reservoir, a liquid delivery means, and a heating element, but the present invention is not limited thereto. For example, the liquid reservoir, the liquid delivery means, and the heating element may be included as independent modules in the aerosol-generating device 100.

30 [0084] The liquid reservoir may store a liquid composition. For example, the liquid composition may be a liquid including a tobacco-containing material including a volatile tobacco flavor component. Alternatively or additionally, the liquid composition may be a liquid including a non-tobacco material. The liquid reservoir may be manufactured to be detachable from/attachable to the vaporizer 140 or manufactured integrally with the vaporizer 140.

35 [0085] For example, the liquid composition may include water, a solvent, ethanol, a plant extract, a flavoring, a flavoring agent, and/or a vitamin mixture. The flavoring may include menthol, peppermint, spearmint oil, and/or various types of fruit flavoring components, but the present invention is not limited thereto. The flavoring agent may include a component that can provide various types of flavors to a user. The vitamin mixture may be a mixture of at least one of vitamin A, vitamin B, vitamin C, and vitamin E, but the present invention is not limited thereto. Particularly, the liquid composition may include an aerosol-forming agent such as glycerin and propylene glycol.

40 [0086] The liquid delivery means may deliver the liquid composition in the liquid reservoir to the heating element. For example, the liquid delivery means may be a wick such as cotton fiber, ceramic fiber, glass fiber, and/or a porous ceramic, but the present invention is not limited thereto.

45 [0087] The heating element is an element for heating the liquid composition delivered by the liquid delivery means. For example, the heating element may include a metal heating wire, a metal heating plate, and/or a ceramic heater, but the present invention is not limited thereto. Particularly, the heating element may be composed of a conductive filament such as a nichrome wire, and may be disposed in a structure that is wound around the liquid delivery means. The heating element may be heated by current supply and may heat the liquid composition by transferring heat to the liquid composition in contact with the heating element. As a result, an aerosol may be generated.

[0088] For example, the vaporizer 140 may be referred to as a cartomizer or an atomizer, but the present invention is not limited thereto.

50 [0089] Meanwhile, the aerosol-generating device 100 may further include general-purpose components in addition to the battery 110, the control unit 120, the heater 130, and the vaporizer 140. For example, the aerosol-generating device 100 may include a display capable of outputting visual information and/or a motor for outputting tactile information. Particularly, the aerosol-generating device 100 may include at least one sensor (a puff sensor, a temperature sensor, and/or an aerosol-generating article insertion sensor). Particularly, the aerosol-generating device 100 may be manufactured so that external air can be introduced or internal gas can be discharged even when the smoking article 200 is inserted.

55 [0090] Although not shown in FIGS. 1 to 3, the aerosol-generating device 100 may constitute a system together with a separate cradle. For example, the cradle may be used to charge the battery 110 of the aerosol-generating device 100.

Alternatively or additionally, the heater 130 may be heated while the cradle and the aerosol-generating device 100 are combined.

**[0091]** The smoking article 200 may be similar to a general combustion-type cigarette. For example, the smoking article 200 may be divided into a first portion including an aerosol-generating material and a second portion including a filter and the like. Optionally, an aerosol-generating material may also be included in the second portion of the smoking article 200. For example, a granular and/or capsule-type aerosol-generating material may be included in the first portion and optionally in the second portion.

**[0092]** The entire first portion may be inserted into the inside of the aerosol-generating device 100, and the second portion may be exposed to the outside. Alternatively, only a portion of the first portion may be inserted into the inside of the aerosol-generating device 100, or the entire first portion and a portion of the second portion may be inserted. A user may inhale an aerosol while holding the second portion in his/her mouth. In this case, an aerosol is generated by passing external air through the first portion, and the generated aerosol is delivered to the user's mouth by passing through the second portion.

**[0093]** In some embodiments, external air may be introduced through at least one air path formed in the aerosol-generating device 100. For example, the opening and closing and/or size of the air path formed in the aerosol-generating device 100 may be adjusted by a user. Accordingly, a vapor amount, a feeling of smoking, and the like may be adjusted by a user. In another example, external air may be introduced into the inside of the smoking article 200 through at least one hole formed in the surface of the smoking article 200.

**[0094]** Next, referring to FIG. 4, FIG. 4 shows an example of an aerosol-generating device using an induction heating method.

**[0095]** Referring to FIG. 4, an aerosol-generating device 100 includes a battery 110, a control unit 120, a coil C, and a susceptor S. Particularly, at least a portion of a smoking article 200 may be accommodated in a void V of the aerosol-generating device 100. The smoking article 200, the battery 110, and the control unit 120 of FIG. 4 may correspond to the smoking article 200, the battery 110, and the control unit 120 of FIGS. 1 to 3. Particularly, the coil C and the susceptor S may be included in the heater 130. Therefore, duplicate descriptions are omitted.

**[0096]** In the aerosol-generating device 100 shown in FIG. 4, components related to the present embodiment are shown. Therefore, it can be understood by those skilled in the art related to the present embodiment that other general-purpose components may be further included in the aerosol-generating device 100 in addition to the components shown in FIG. 4.

**[0097]** The coil C may be positioned around the void V. It is illustrated in FIG. 4 that the coil C is disposed to surround the void V, but the present invention is not limited thereto.

**[0098]** When the smoking article 200 is accommodated in the void V of the aerosol-generating device 100, the aerosol-generating device 100 may supply power to the coil C so that the coil C generates a magnetic field. As the magnetic field generated by the coil C passes through the susceptor S, the susceptor S may be heated.

**[0099]** This induction heating phenomenon is a well-known phenomenon explained by Faraday's law of induction. Particularly, when the magnetic induction in the susceptor S changes, an electric field is generated in the susceptor S, and thus eddy currents flow within the susceptor S. Eddy currents generate heat proportional to the current density and conductor resistance within the susceptor S.

**[0100]** As the susceptor S is heated by eddy currents and an aerosol-generating material in the smoking article 200 is heated by the heated susceptor S, an aerosol may be generated. The aerosol generated from the aerosol-generating material is delivered to a user by passing through the smoking article 200.

**[0101]** The battery 110 may supply power so that the coil C can generate a magnetic field. The control unit 120 may be electrically connected to the coil C.

**[0102]** The coil C may be an electrically conductive coil that generates a magnetic field by power supplied from the battery 110. The coil C may be disposed to surround at least a portion of the void V. The magnetic field generated by the coil C may be applied to the susceptor S disposed at the inner end of the void V.

**[0103]** The susceptor S may be heated as the magnetic field generated from the coil C passes therethrough, and may include a metal and/or carbon. For example, the susceptor S may include at least one of ferrite, ferromagnetic alloys, stainless steel, and aluminum.

**[0104]** The susceptor S may include at least one of graphite, molybdenum, silicon carbide, niobium, nickel alloys, metal films, ceramics such as zirconia, transition metals such as nickel (Ni) and cobalt (Co), and metalloids such as boron (B) or phosphorus (P). However, the susceptor S is not limited to the above-described examples, and any susceptor may be used without limitation as long as it can be heated to a desired temperature by applying a magnetic field. Here, the desired temperature may be preset in the aerosol-generating device 100 or may be set by a user.

**[0105]** When the smoking article 200 is accommodated in the void V of the aerosol-generating device 100, the susceptor S may be disposed to surround at least a portion of the smoking article 200. Therefore, the heated susceptor S may increase the temperature of an aerosol-generating material in the smoking article 200.

**[0106]** It is illustrated in FIG. 4 that the susceptor S is disposed to surround at least a portion of the aerosol-generating

article, but the present invention is not limited thereto. For example, the susceptor S may include a tubular heating element, a plate-shaped heating element, a needle-shaped heating element, and/or a rod-shaped heating element, and the inside and/or outside of the smoking article 200 may be heated according to the shape of a heating element.

5 [0107] Particularly, a plurality of susceptors S may be disposed in the aerosol-generating device 100. In this case, a plurality of susceptors S may be disposed outside the smoking article 200 and may be disposed so as to be inserted into the inside. Particularly, some of the plurality of susceptors S may be disposed so as to be inserted into the inside of the smoking article 200, and the remainder may be disposed outside the smoking article 200. Also, the shape of the susceptor S is not limited to the shape shown in FIG. 4, and the susceptor may be manufactured in various shapes.

[0108] FIG. 5 is a diagram showing a smoking article according to an embodiment.

10 [0109] Referring to FIG. 5, a smoking article 200 may include a first portion 210, a second portion 220, a third portion 230, and a fourth portion 240. Particularly, the first portion 210, the second portion 220, the third portion 230, and the fourth portion 240 may include an aerosol-generating element, a tobacco element, a cooling element, and a filtering element, respectively. In some embodiments, the first portion 210 may include an aerosol-generating material, the second portion 220 may include a tobacco material and optionally one or more humectants, the third portion 230 may cool the airflow passing through the first portion 210 and the second portion 220, and the fourth portion 240 may include a filtering material. Meanwhile, to emphasize the function of the third portion 230 and the fourth portion 240 as filters, the third portion 230 may be referred to as a cooling structure 230, and the fourth portion 240 may be referred to as a mouthpiece 240.

15 [0110] Referring to FIG. 5, the first portion 210, the second portion 220, the third portion 230, and the fourth portion 240 may be sequentially arranged based on a longitudinal direction of the smoking article 200. Here, the longitudinal direction of the smoking article 200 may be a direction in which the length of the smoking article 200 extends. For example, the longitudinal direction of the smoking article 200 may be a direction from the first portion 210 toward the fourth portion 240. Accordingly, an aerosol generated in at least one of the first portion 210 and the second portion 220 forms an airflow by sequentially passing through the first portion 210, the second portion 220, the third portion 230, and the fourth portion 240, and thus a smoker may inhale the aerosol from the fourth portion 240.

20 [0111] The first portion 210 may include an aerosol-generating element. Particularly, one or more other additional materials such as a flavoring agent, a wetting agent, and/or an organic acid may be included, and a flavoring liquid including menthol and/or a humectant may be included. In this case, the aerosol-generating element may include, for example, at least one of glycerin, propylene glycol, ethylene glycol, dipropylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, and oleyl alcohol. However, the present disclosure is not limited to the above-described examples, and various types of aerosol-generating elements widely known in the art may be included in the present disclosure.

25 [0112] The first portion 210 may include an aerosol-generating substrate impregnated with an aerosol-generating element. Examples of the aerosol-generating substrate may include a crimped sheet, and the aerosol-generating element may be included in the first portion 210 while being impregnated into the crimped sheet. Particularly, one or more other additional materials such as a flavoring agent, a wetting agent, and/or an organic acid, and/or a flavoring liquid may be included in the first portion 210 in a state of being absorbed into the crimped sheet.

30 [0113] The crimped sheet may be a sheet made of a polymer material. For example, the polymer material may include at least one of paper, cellulose acetate, and polylactic acid. For example, the crimped sheet may be a paper sheet that does not generate an off-flavor caused by heat even when heated to a high temperature. However, the present invention is not limited thereto.

35 [0114] The first portion 210 may extend to a point about 7 mm to about 20 mm from the end of the smoking article 200, and the second portion 220 may extend to a point about 7 mm to about 20 mm from the end of the first portion 210. However, the present invention is not necessarily limited to these numerical ranges, and the length by which each of the first portion 210 and the second portion 220 extends may be appropriately adjusted within the range that can be easily changed by those skilled in the art. For example, the first portion 210 may have a length of about 10 mm, and the second portion may have a length of about 12 mm, but the present invention is not limited thereto.

40 [0115] The second portion 220 may include a tobacco element. The tobacco element may be a specific type of tobacco material. For example, the tobacco element may be in the form of shredded tobacco, tobacco particles, tobacco sheets, tobacco beads, tobacco granules, tobacco powder, and/or tobacco extracts. Particularly, the tobacco material may include, for example, one or more of tobacco leaves, tobacco leaf veins, expanded tobacco, shredded tobacco, reconstituted shredded tobacco leaves, and reconstituted tobacco.

45 [0116] The third portion 230 may cool an airflow passing through the first portion 210 and the second portion 220. The third portion 230 may be manufactured using a biodegradable polymer material and may have a cooling function.

50 [0117] In an embodiment, the third portion 230 may be manufactured using lyocell fibers. Particularly, the third portion 230 may be a lyocell filter composed of lyocell tow including a plurality of lyocell fibers. The third portion 230 may be a tubular structure with a hollow formed therein. The hollow may extend along the longitudinal direction of the third portion 230. The hollow of the third portion 230 may be located in the center of a cross-section perpendicular to the longitudinal direction of the third portion 230, and may be disposed so that it extends in the longitudinal direction. The hollow of the third

portion 230 may be coaxial with the third portion 230. A length and/or diameter of the third portion 230 may vary depending on the shape of the smoking article 200. For example, a length of the third portion 230 may be appropriately adjusted in a range of 7 mm to 20 mm. Preferably, the third portion 230 may have a length of about 12 mm, but the present invention is not limited thereto.

5 **[0118]** In the present invention, the lyocell fibers included in the third portion 230 may be eco-friendly fibers made of cellulose extracted from wood pulp. The lyocell tow may refer to a bundle formed by cross-connecting adjacent lyocell fibers.

10 **[0119]** In some embodiments, the third portion 230 may have an outer diameter of about 6 mm to 10 mm, preferably 6.1 mm to 9 mm, more preferably 6.2 mm to 8 mm, even more preferably 6.3 mm to 7.8 mm, even more preferably 6.4 mm to 7.6 mm, even more preferably 6.6 mm to 7.4 mm, even more preferably 6.8 mm to 7.2 mm, and even more preferably 7 mm. The third portion 230 may have an inner diameter (i.e., the diameter of the hollow) smaller than the outer diameter, that is, an appropriate inner diameter in a range of about 2 mm to 6 mm, preferably 2.1 mm to 5.5 mm, more preferably 2.2 mm to 5 mm, even more preferably 2.3 mm to 4.5 mm, and even more preferably 2.4 mm to 4 mm, but the present invention is not limited thereto. Preferably, the third portion 230 may have an inner diameter of 2.5 mm to 3.0 mm or 3.5 mm to 4.0 mm, preferably 2.7 mm to 2.9 mm or 3.7 mm to 3.9 mm, and more preferably 2.8 mm or 3.8 mm, but the present invention is not limited thereto.

15 **[0120]** In some embodiments, the inner diameter of the third portion 230 may be 10% to 90%, preferably 20% to 80%, more preferably 25% to 75%, and even more preferably 30% to 70% or 35% to 75% of the outer diameter of the third portion 230, but the present invention is not limited thereto.

20 **[0121]** In some embodiments, the lyocell fibers may have a shaped cross-section. A shaped cross-section is defined as a cross-section having a shape including a plurality of protrusions instead of having a circular shape. For example, a cross-section having a shape in which a plurality of protrusions extend from the center may be referred to as a shaped cross-section.

25 **[0122]** In some embodiments, the lyocell fibers may have a Y-shaped cross-section with three protrusions branching from the center, a cross-shaped cross-section with four protrusions, and/or a star-shaped cross-section with five protrusions, or an O-shaped cross-section, but the present invention is not limited thereto.

30 **[0123]** In some embodiments, the third portion 230 may further include a binder. The binder may be dispersed in the lyocell tow constituting the third portion 230. Particularly, the binder may be distributed in the entire area of the lyocell tow constituting the third portion 230. The binder serves to impart appropriate hardness to the third portion 230 by binding between a plurality of lyocell fibers constituting the lyocell tow. As described above, unlike cellulose acetate, lyocell does not have any plasticizer that hardens lyocell fibers, so by adding a binder instead, appropriate hardness may be imparted to the third portion 230.

35 **[0124]** In some embodiments, the binder may include at least one of a cellulose-based binder, a vinyl-based binder, a polyester-based binder, a dextrin-based binder, a starch-based binder, guar gum, xanthan gum, Arabic gum, carrageenan, konjac, and agar, but the present invention is not limited thereto as long as it is a material capable of imparting appropriate hardness by binding between a plurality of lyocell fibers. For example, the cellulose-based binder may include hydroxypropyl methyl cellulose (HPMC), ethyl cellulose (EC), methyl cellulose (MC), or carboxymethyl cellulose (CMC), the vinyl-based binder may include polyvinylpyrrolidone (PVP), polyvinyl alcohol (PVA), or ethylene vinyl acetate (EVAc), the polyester-based binder may include a polyester including one or more selected from the group consisting of C5 to C12 alkylenes, arylenes, and heteroarylenes, the dextrin-based binder may include dextrin, and the starch-based binder may include starch (e.g., tapioca, corn, wheat, potato, and/or sweet potato), cationic starch, and/or esterified starch, but the present invention is not limited thereto.

40 **[0125]** In some embodiments, the binder may include at least one of a polyester including one or more selected from the group consisting of C5 to C12 alkylenes, arylenes, and heteroarylenes, HPMC, EC, MC, CMC, PVP, PVA, EVAc, dextrin, tapioca starch, corn starch, wheat starch, potato starch, sweet potato starch, cationic starch, esterified starch, guar gum, xanthan gum, Arabic gum, carrageenan, konjac, and agar.

45 **[0126]** In some embodiments, the binder may be added so as to be dispersed in lyocell tow during the manufacturing process of the third portion 230. For example, during the manufacturing process of the third portion 230, the binder may be added to the inside of lyocell tow by wrapping a heater rod with lyocell tow and spraying the binder onto the outer surface of the cylindrical lyocell tow formed to wrap around the heater rod from the inside, and alternatively or additionally, the binder may be added to the inside of lyocell tow by adding the binder through the inner surface of the lyocell tow formed to wrap around the heater rod from the inside, from the heater rod, but the method of manufacturing the third portion 230 is not limited thereto.

50 **[0127]** In some embodiments, the third portion 230 including the lyocell tow in which the binder is dispersed may have a hardness of 60% to 99%, preferably 70% to 98.5%, more preferably 75% to 98%, even more preferably 80% to 97.5%, and even more preferably 85% to 97%, but the present invention is not limited thereto. The hardness of the third portion 230 is a value obtained by quantifying the degree to which a diameter of the third portion 230 is maintained when the third portion 230 is pressed with a certain level of force in a direction perpendicular to the longitudinal direction of the third portion 230,

and may be a percentage value of a ratio of a diameter of the third portion 230 after the force is applied to a diameter of the third portion 230 before the force is applied. When the third portion 230 has a hardness within the above range, the third portion 230 can exhibit an effect of stably maintaining its shape despite having a tubular structure composed of lyocell tow, and the stable shape maintenance of the third portion 230 can prevent the quality of a smoking experience from being degraded due to deformation of the third portion 230 when the smoking article 200 is stored and/or smoked.

**[0128]** Since the smoking article 200 according to the present invention includes the third portion 230 composed of lyocell tow and having a tubular shape with a hollow formed therein, the amount of moisture delivered during smoking is effectively reduced due to the superior moisture affinity of the lyocell tow compared to cellulose acetate tow, and accordingly, the heat felt by a user can be reduced and a cooling effect can be maximized. Also, since an off-flavor caused by heat is not generated compared with a paper tube, the quality of smoking can be improved.

**[0129]** In addition, the excellent heat resistance of the lyocell tow can effectively prevent or minimize the deformation of the third portion 230 resulting from the heat transferred from a heater for heating the smoking article 200 or an aerosol generated in the smoking article 200.

**[0130]** The fourth portion 240 may include a filtering element. For example, the fourth portion 240 may be a cellulose acetate filter. Meanwhile, there is no limitation on the shape of the fourth portion 240. For example, the fourth portion 240 may be a cylindrical rod or a tubular rod with a hollow formed therein. Particularly, the fourth portion 240 may be a recess-type rod. When the fourth portion 240 is composed of a plurality of segments, at least one of the plurality of segments may be manufactured to have a different shape from the other segments. A length of the fourth portion 240 may be appropriately adjusted in the range of 7 mm to 20 mm. Preferably, the fourth portion 240 may have a length of about 14 mm, but the present invention is not limited thereto.

**[0131]** The fourth portion 240 may be manufactured so as to generate a flavor. In some embodiments, a flavoring liquid may be sprayed onto the fourth portion 240, and alternatively or additionally, a separate fiber coated with a flavoring liquid may be inserted into the inside of the fourth portion 240.

**[0132]** The smoking article 200 may include a wrapper 250 that surrounds at least a portion of the first portion 210 to the fourth portion 240. Particularly, the smoking article 200 may include a wrapper 250 that surrounds all of the first portion 210 to the fourth portion 240. The wrapper 250 may be located on the outermost surface of the smoking article 200, and the wrapper 250 may be a single wrapper or a combination of a plurality of wrappers.

**[0133]** In some embodiments, the first portion 210 of the smoking article 200 may include a crimped sheet containing an aerosol-generating material, the second portion 220 may include reconstituted shredded tobacco leaves as a tobacco material and optionally include glycerin as a humectant, the third portion 230 may include lyocell tow including a plurality of lyocell fibers, and the fourth portion 240 may include cellulose acetate (CA) fibers, but the present disclosure is not necessarily limited thereto.

**[0134]** Hereinafter, the configurations of the present invention and the advantageous effects according thereto will be described in more detail using examples and comparative examples. However, the examples are merely for describing the present invention in more detail, and the scope of the present invention is not limited to these examples.

Example 1

**[0135]** A third portion with the structure shown in FIG. 5 was manufactured using a lyocell material. Particularly, a heater rod was used to form cylindrical lyocell tow so that the lyocell tow surrounded the heater rod, and a dextrin-based binder (dextrin) was injected into the lyocell tow through the inner surface of the lyocell tow from the heater rod, thereby forming a third portion having an inner diameter of about 3.8 mm and a circumference of 22.6 mm. Afterward, like the smoking article 200 shown in FIG. 4, a heating-type cigarette (a smoking article of Example 1) having a first portion composed of paper, having a length of 10 mm and including an aerosol-generating element, a second portion having a length of 12 mm and including a tobacco material, a third portion having a length of 12 mm, and a fourth portion having a length of 14 mm and composed of cellulose acetate was manufactured, and the draw resistance was measured and shown in Table 1 below.

**[0136]** Unless otherwise specified herein, PDC may refer to a draw resistance value measured in a state in which the second portion is open, the perforations formed in any one of the first, third, and fourth portions are blocked, and the inflow of external air is blocked, and PDO may refer to a draw resistance value measured in a state in which the second portion is open, the perforations formed in any one of the first, third, and fourth portions are not blocked, and the inflow of external air is allowed.

Comparative Example 1

**[0137]** A heating-type cigarette (a smoking article of Comparative Example 1) was manufactured in the same manner as in Example 1, except that a third portion was manufactured using a cellulose acetate material, and the draw resistance was measured and shown in Table 1 below.

**Experimental Example 1. Evaluation of physical properties**

[0138] In order to examine the change in physical properties of the smoking articles according to the material constituting the third portion, an experiment for measuring the physical properties of the smoking articles according to Comparative Example 1 and Example 1 was conducted. Particularly, the weight, circumference, and draw resistance (ventilation rate; Vent) of the smoking articles were measured, and the measurement results are shown in the following Table 1.

[Table 1]

Classification	Weight (mg)	Circumference (mm)	PDO (mmH <sub>2</sub> O)	PDC (mmH <sub>2</sub> O)	Vent (%)
Comparative Example 1	524.6	22.6	52.3	87.0	53.4
Example 1	<u>537.6</u>	<u>22.6</u>	<u>51.5</u>	<u>84.8</u>	<u>53.3</u>

(In Table 1, Vent refers to a ventilation rate (VR).)

[0139] Referring to Table 1, it can be confirmed that the smoking articles including lyocell tow and cellulose acetate, respectively, as a material constituting the third portion had similar physical properties, and similar levels of the ventilation rate (VR) and draw resistance, which may be associated with heat resistance and cooling during smoking, were exhibited.

**Experimental Example 2. Moisture transfer amount (heat sensation reducing effect) of smoking article according to material of third portion (cooling element)**

[0140] In order to compare the moisture transfer amount in the mainstream smoke of the smoking articles according to the material constituting the third portion, the second portion (tobacco element) of the smoking articles according to Comparative Example 1 and Example 1 was heated to a heating temperature of 190 °C to 280 °C by an external heating method, and the amount of moisture in the generated smoke (a moisture transfer amount) was measured and shown in Table 2 below.

[0141] Particularly, an experiment was conducted using the smoking articles according to Comparative Example 1 and Example 1 in a smoking room with an internal temperature of about 22 ± 2 °C and an internal relative humidity of about 60 ± 5% (specifically, a temperature of about 21.9 °C and a relative humidity of 64.3%), smoking was performed under Health Canada (HC) conditions (puff volume: 55 ml, puff frequency: 30 s, puff duration: 2 s, and puff count: 9 puffs), the generated smoke was collected on a Cambridge filter (i.e., a Cambridge filter pad (CFP)), and the amount of moisture collected on the Cambridge filter (pad) (the moisture transfer amount) was measured and shown in the following Table 2.

[Table 2]

Classification	Moisture transfer amount (mg)
Comparative Example 1	22.91
Example 1	16.19

[0142] Referring to Tables 1 and 2, it can be confirmed that the smoking articles according to Example 1 and Comparative Example 1 had similar physical properties, but the smoking article of Example 1 exhibited a lower moisture amount in mainstream smoke than the smoking article of Comparative Example 1. In other words, since the smoking article of Example 1 exhibited a lower moisture transfer amount in mainstream smoke than the smoking article of Comparative Example 1, the smoking article of Example 1 having a third portion composed of a lyocell material delivered less heat (hot sensation) to a user through mainstream smoke during smoking than the smoking article of Comparative Example 1 including a third portion composed of cellulose acetate. This may be inferred to be due to the fact that the moisture generated during smoking is absorbed into the lyocell tow constituting the third portion while passing through the third portion composed of lyocell because the lyocell material has superior moisture affinity compared to the cellulose acetate material. In other words, the smoking article of Example 1 having the third portion composed of a lyocell material has a superior effect of reducing the heat felt by a smoker during smoking compared to the smoking article of Comparative Example 1 having the third portion composed of a cellulose acetate material.

**Experimental Example 3. Evaluation of deformation caused by heat according to material of third portion**

[0143] In order to analyze the material deformation caused by the heat generated during heating of the tobacco element (the second portion) of the smoking articles according to the material constituting the third portion, the second portion of the

smoking articles according to Comparative Example 1 and Example 1 was heated in the same manner as in Experimental Example 2 (i.e., heating to a heating temperature of 190 °C to 280 °C by an external heating method), then the resulting smoking article was disassembled, and the third portion was photographed, which is shown in FIG. 6. FIG. 6A shows an image obtained by photographing the third portions of Comparative Example 1 and Example 1 before the experiment (before smoking), the left side in FIG. 6A is the third portion of Comparative Example 1, and the right side in FIG. 6A is the third portion of Example 1. Also, FIG. 6B shows an image obtained by photographing the third portions of Comparative Example 1 and Example 1 after the experiment (after smoking), the left side in FIG. 6B is the third portion of Comparative Example 1, and the right side in FIG. 6B is the third portion of Example 1.

[0144] Referring to FIG. 6A, it can be confirmed that the appearances of the third portion composed of cellulose acetate of Comparative Example 1 and the third portion composed of lyocell of Example 1 before smoking were substantially the same.

[0145] Referring to FIG. 6B, it can be confirmed that after smoking (i.e., after heating to a temperature of 190 °C to 280 °C and puffing), the third portion of Comparative Example 1 turned yellow, whereas the third portion of Example 1 was not discolored. From the above result, it can be seen that a cellulose acetate material is discolored due to the heat generated in the smoking article during smoking, whereas a lyocell material is not discolored.

[0146] In addition, it can be confirmed that the third portion of Comparative Example 1 after smoking was not only discolored but also melted and stuck, and thus the shape became smaller than the original shape by exhibiting a shape different from the shape of a wrapper surrounding the third portion. On the other hand, it can be confirmed that the third portion of Example 1 largely maintained its original shape by exhibiting substantially the same shape as the shape of a wrapper. In other words, the cellulose acetate material (Comparative Example 1) is deformed by a melting phenomenon due to heat, whereas the lyocell material (Example 1) did not melt due to heat and thus was not deformed.

[0147] It can be considered that by having superior heat resistance compared to the cellulose acetate material, the lyocell material can effectively prevent or minimize the deformation that occurs due to the heat generated during smoking, the heat in an aerosol, and/or the heat for heating a tobacco element (a second portion). Therefore, it can be seen that the third portion of Example 1 can exhibit superior heat absorption performance compared to the third portion of Comparative Example 1, and maintain the original shape without material deformation due to excellent heat resistance.

### Examples 2 and 3

[0148] Similar to Example 1, a third portion of Example 2 having an inner diameter of about 2.8 mm and a circumference of 22.6 mm and a third portion of Example 3 having an inner diameter of about 3.8 mm and a circumference of 22.6 mm were manufactured. Like the smoking article 200 shown in FIG. 1, heating-type cigarettes (smoking articles of Examples 2 and 3) having a first portion composed of paper, having a length of 10 mm, and including an aerosol-generating element, a second portion having a length of 12 mm and including a tobacco material, the third portion of Example 2 or 3, and a fourth portion having a length of 14 mm and composed of cellulose acetate were manufactured, and physical properties were measured and shown in the following Table 3.

[Table 3]

Classification (Inner diameter)	Weight (mg)	Circumference (mm)	PDO (mmH <sub>2</sub> O)	PDC (mmH <sub>2</sub> O)	Vent (%)
Example 2 (2.8 mm)	537.5	22.586	52.6	90.9	55.64
Example 3 (3.8 mm)	524.6	22.584	52.3	87.0	54.43

(In Table 3, Vent refers to a ventilation rate (VR).)

### **Experimental Example 4. Analysis of components in smoke according to inner diameter of third portion**

[0149] In order to compare the components in smoke according to the inner diameter of the third portion, the second portion of each of the smoking articles of Examples 2 and 3 was heated to a heating temperature of 190 °C to 280 °C by an external heating method, and total particulate matter (TPM), nicotine component, and moisture contents, and the like were measured and shown in Table 4 below.

[0150] Particularly, an experiment was conducted using the smoking articles according to Examples 2 and 3 in a smoking room with an internal temperature of about 22±2 °C and an internal relative humidity of about 60±5% (particularly, a temperature of about 21.9 °C and a relative humidity of 64.3%), smoking was performed under HC conditions (puff volume: 55 ml, puff frequency: 30 s, puff duration: 2 s, and puff count: 9 puffs), and the generated smoke was collected on a Cambridge filter (i.e., a Cambridge filter pad (CFP)) and analyzed. The total particulate matter (TPM) is a value obtained by measuring the change in weight of the Cambridge filter before and after smoking using a smoking device. For the remaining components, the collected smoke was analyzed by gas chromatography (GC).

[Table 4]

Classification	TPM (mg)	Tar (mg)	Nic (mg)	PG (mg)	Gly (mg)	Moisture (mg)
Example 2	31.03	12.88	0.39	0.19	0.87	17.77
Example 3	30.17	12.93	0.47	0.23	1.11	16.77

**[0151]** Referring to Table 4, the components in smoke transferred during smoking may vary depending on the difference in the inner diameter of the third portion. Particularly, the smoking article of Example 2 including a third portion having an inner diameter of 2.8 mm exhibited a moisture transfer amount of 17.77 mg, and the smoking article of Example 3 including a third portion having an inner diameter of 3.8 mm exhibited a moisture transfer amount of 16.77 mg. Since the smoking article of Example 3 exhibits a larger moisture transfer amount than the smoking article of Example 2, it can be seen that as the inner diameter of the tubular structure is larger, the effect of reducing the heat felt by a user is better. In addition, the smoking article of Example 2 exhibited a total atomization amount (PG+Gly) of 1.06 mg, and the smoking article of Example 3 exhibited a total atomization amount (PG+Gly) of 1.34 mg. From the above result, it can be seen that the smoking article of Example 3 produces a larger atomization amount than the smoking article of Example 2. In other words, since the smoking article of Example 3 including a third portion having an inner diameter of 3.8 mm has a similar Tar content but exhibits a smaller moisture transfer amount and a larger atomization amount compared to the smoking article of Example 2 including a third portion having an inner diameter of 2.8 mm, a cooling effect and atomization are excellent, and the quality of smoking is improved.

**[0152]** Although the embodiments of the present disclosure have been described above with reference to the accompanying drawings, those of ordinary skill in the art to which the present disclosure pertains should understand that the present disclosure may be embodied in other specific forms without changing the technical spirit or essential features thereof. Therefore, the embodiments described above should be understood as being illustrative, instead of limiting, in all aspects. The scope of protection of the present disclosure should be interpreted by the claims below, and all technical ideas within the scope equivalent to the claims should be interpreted as falling within the scope of rights of the technical spirit defined by the present disclosure.

[EXPLANATION OF DRAWING SYMBOLS]

**[0153]**

- 200: smoking article
- 210: first portion
- 220: second portion
- 230: third portion
- 240: fourth portion

**Claims**

**1.** A smoking article comprising:

a first portion including an aerosol-generating substrate impregnated with an aerosol-generating element;  
 a second portion including a tobacco element;  
 a third portion including a cooling element; and  
 a fourth portion including a filtering element,  
 wherein the first portion, the second portion, the third portion, and the fourth portion are sequentially arranged along the longitudinal direction of the smoking article, and  
 the third portion includes lyocell tow including a plurality of lyocell fibers.

**2.** The smoking article of claim 1, wherein the lyocell tow of the third portion has a tubular shape with a hollow formed therein.

**3.** The smoking article of claim 1, wherein the third portion further includes a binder dispersed in a plurality of the lyocell tow.

**4.** The smoking article of claim 3, wherein the binder includes at least one of a cellulose-based binder, a vinyl-based

binder, a polyester-based binder, a dextrin-based binder, and a starch-based binder.

5 5. The smoking article of claim 2, wherein an inner diameter of the third portion is 10 to 90% of an outer diameter of the third portion.

6. The smoking article of claim 2, wherein the outer diameter of the third portion is 6 mm to 10 mm, and the inner diameter of the third portion is 2 mm to 6 mm.

10 7. The smoking article of claim 1, wherein the fourth portion includes at least one of cellulose acetate and lyocell.

8. The smoking article of claim 1, wherein the aerosol-generating element includes at least one of glycerin, propylene glycol, ethylene glycol, dipropylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, and oleyl alcohol.

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FIG.1

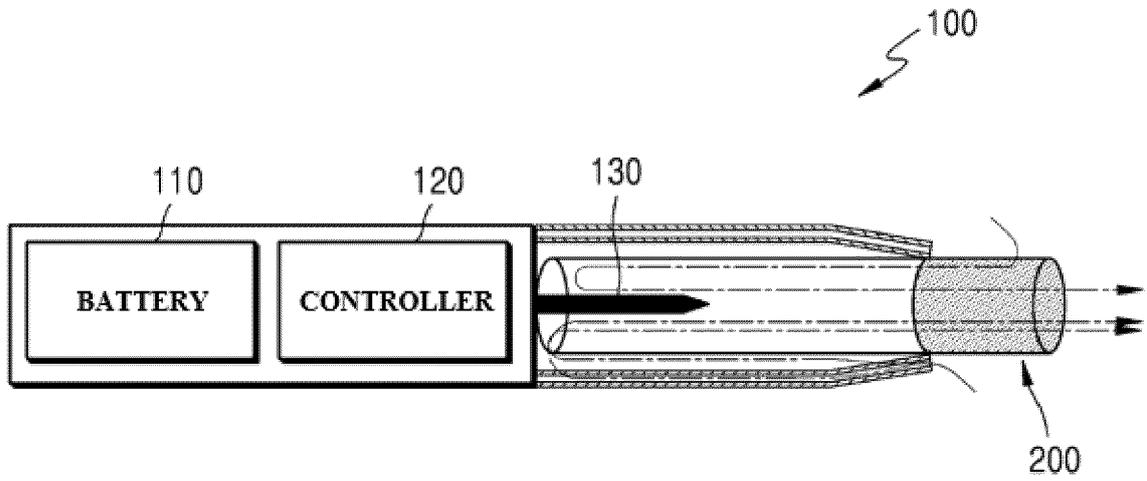


FIG.2

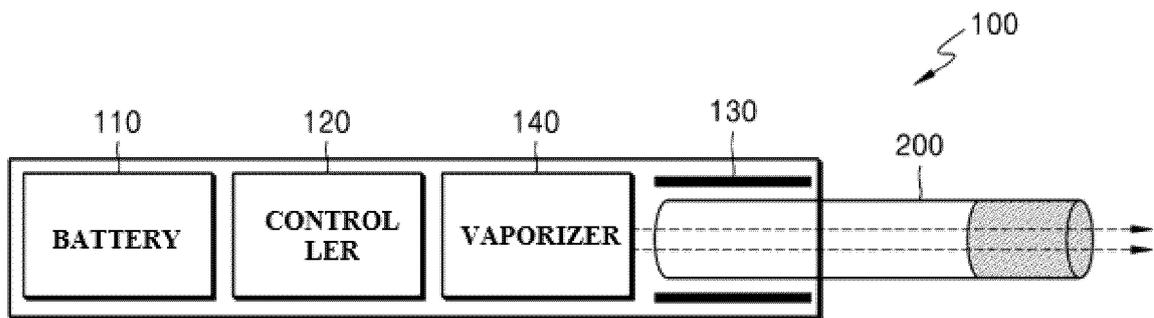


FIG.3

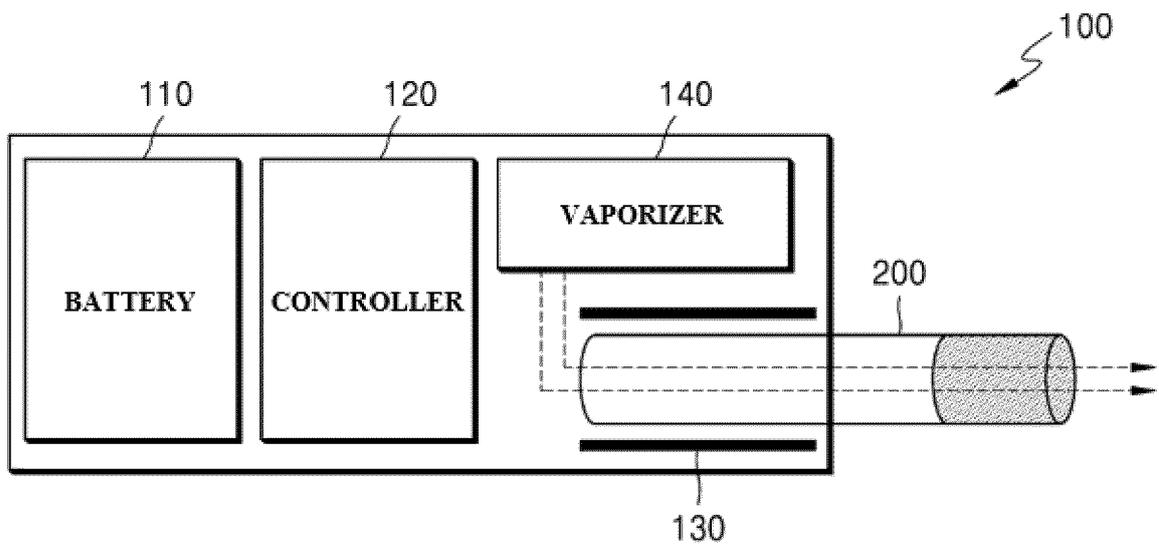


FIG.4

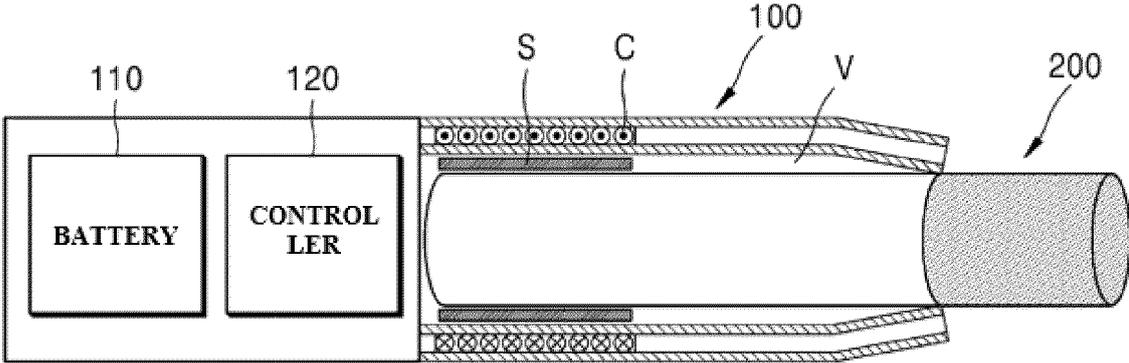


FIG.5

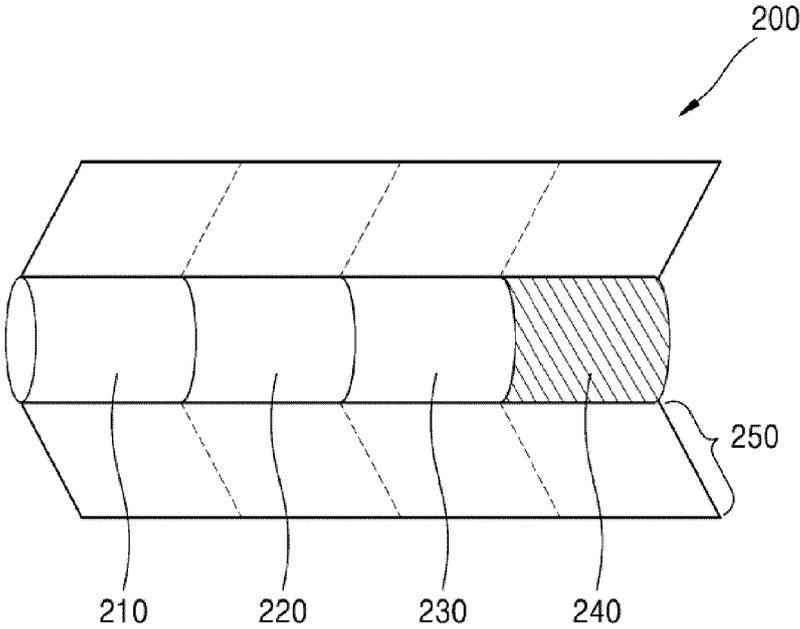
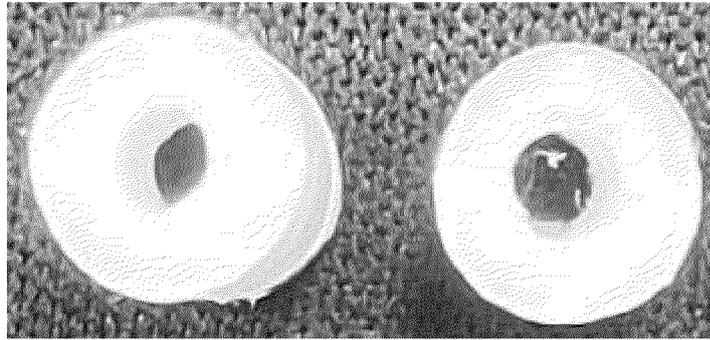
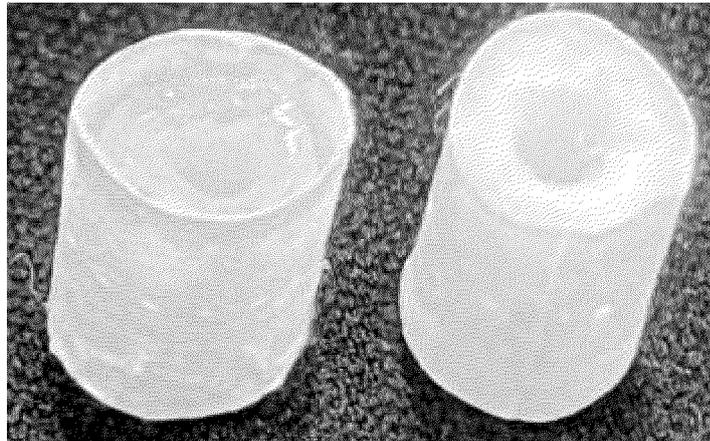


FIG.6

(A)



(B)





EUROPEAN SEARCH REPORT

Application Number

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	WO 2023/112267 A1 (JAPAN TOBACCO INC [JP]) 22 June 2023 (2023-06-22) * paragraph [0001] - paragraph [0107]; claims; figures *	1-8	INV. A24B15/16 A24D1/20 A24D3/04 A24D3/06 A24D3/10 A24D3/14
Y	WO 2020/256341 A1 (KT & G CORP [KR]) 24 December 2020 (2020-12-24) * paragraph [0001] - paragraph [0072]; figures *	1-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			A24B A24F A24D
The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>19 May 2025</b>	Examiner <b>Alevisopoulos, S</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

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WO 2020256341 A1	24-12-2020	NONE	
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82